Variability in the Vertical Structures of 1 lumidity and 11 Micron Radiation in the Atmosphere Overlying the Western Pacific 'Warm' Pool Region

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During the Tropical Ocean Global Atmosphere Coupled Ocean-Atmosp here Response Experiment, a comprehensive set of high precision multi-spectral observations in the 10 to 12 micron region were acquired by a downward-looking radiometer coincident with in situ atmospheric parameters. The observations were obtained from the National Center for Atmospheric Research Electra aircraft from near the ocean surface (30 m) to levels near or exceeding 4 km (it., through most of the tropospheric water vapor). The radiation measurements were obtained under a variety of atmospheric conditions that evolved in relation to the 40 to 60 day warming cycle in sea surface temperature (SS'1'). As would be expected, variations in the profile of upward radiance correlate extremely well with the humidity distribution. The upward radiance through the first 5 km was calculated for several bandpass regions using the in situ atmospheric data acquired during the profiling experiments. The results show that the attenuation of outgoing surface radiance due to water vapor absorption effects is reasonably well modeled for tropical conditions. The reduction in radiance from the surface to 4 km is found to be relatively constant for SST values ranging from 28 to 31°C, except for cases of strong atmospheric turbulence or liquid water absorption. We examine the relationships between radiation, SS'1', air temperature, humidity, and aerosol concentration during the development and demise of a shallow well mixed boundary layer.

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